REMARKS

The Applicants respectfully request reconsideration of the rejections set forth in the Office Action dated April 25, 2000. Claims 2 and 7 have been cancelled. Claims 1, 6 and 17 have been amended. Claims 1, 3-6 and 8-22 are pending in this Application. Reconsideration of the application is respectfully requested based on the following remarks.

REJECTION OF CLAIMS 1, 2, 5-7 and 9-22 UNDER 35 U.S.C. §103(a)

The Examiner rejected claims 1, 2, 5-7 and 9-22 under 35 U.S.C. § 103(a) as being unpatentable over Morioka et al. (U.S. Patent No. 5,274,434) taken with Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340). The Applicants respectfully traverse the rejection of claims 1, 2, 5-7 and 9-22.

Claims 1, 6, and 17 have been amended to clarify beneficial features of the present invention. Support for these amendments are found in at least claims 2 and 7, which have been cancelled.

Independent claim 1 discloses an integrated circuit manufacturing system that includes a plurality of interrelated integrated circuit manufacturing tools, a modular optical inspection system, and a handling tool for moving semiconductor wafers. Claim 1 requires that the plurality of interrelated integrated circuit manufacturing tools comprise a cluster tool. After careful review, the Undersigned has been unable to find language within the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) which teaches or suggests a plurality of interrelated integrated circuit manufacturing tools that comprise a cluster tool within an integrated circuit manufacturing system as claimed in claim 1. Therefore, it is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 1. In view of the foregoing, it is respectfully requested that the rejection of claim 1 be withdrawn.

Claim 3, which depends directly from independent claim 1, discloses an integrated circuit manufacturing system in which the modular optical inspection system is situated proximate to an integrated circuit manufacturing tool that is part of the cooling stage. The Undersigned has been unable to find language within the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) which teaches or suggests an integrated circuit manufacturing system as in claim 1 wherein a modular optical inspection system is specifically placed proximate a cooling stage. Therefore, it

is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 3. It is also requested that the rejection of claim 3 be withdrawn.

Claim 4, which depends directly upon claim 3 and indirectly from claim 1, discloses an integrated circuit manufacturing system in which the modular optical inspection system is placed above a window of one of the manufacturing tools. The claimed window allows a modular optical inspection system that is outside of a semiconductor wafer processing environment to image a semiconductor wafer that is within a wafer processing environment. The Undersigned has been unable to find language within the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) which teaches or suggests a modular optical inspection system that is positioned to image a semiconductor wafer through a window of an integrated circuit manufacturing tool. Therefore, it is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 4. It is also requested that the rejection of claim 4 be withdrawn.

Since claim 5 depends directly upon claim 1, it is respectfully submitted that claim 5 is patentable over Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) for at least the same reasons as stated above with respect to claim 1. Therefore, it is requested that that the rejection of claim 5 be withdrawn.

Independent claim 6 claims a method for inspecting a semiconductor by transferring a semiconductor wafer from a plurality of manufacturing tools to an inspection system and moving a semiconductor wafer with respect to a plurality of inspection subsystems. Claim 6 additionally requires that the plurality of manufacturing tools comprise a cluster tool. As discussed with respect to claim 1, the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) fail to teach or suggest a plurality of interrelated integrated circuit manufacturing tools that comprise a cluster tool within an integrated circuit manufacturing system as claimed in claim 6. Therefore, it is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 6. In view of the foregoing, it is requested that the rejection of claim 6 be withdrawn.

Claim 8, which depends directly from claim 6, requires that the claimed method of claim 6 further reuiqre that the optical inspection system be disposed above a window of an integrated circuit manufacturing cooling tool. As previously discussed with respect to claims 3 and 4, the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) fail to teach or suggest an

integrated circuit manufacturing system wherein a modular optical inspection system is specifically placed proximate a cooling stage or wherein a modular optical inspection system is positioned to image a semiconductor wafer through a window of an integrated circuit manufacturing tool. Therefore, it is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 8. It is also requested that the rejection of claim 8 be withdrawn.

Independent claim 17 claims a modular optical inspection system that utilizes a master processor and local processors wherein the inspection system is disposed above a window of an integrated circuit manufacturing tool, which is a cluster tool. As discussed above with respect to claims 1 and 4, the references of Morioka et al. (U.S. Patent No. 5,274,434), Morioka et al. (U.S. Patent No. 5,463,459) and Yamamoto et al. (U.S. Patent No. 5,623,340) fail to teach or suggest a modular optical inspection system that is positioned to image a semiconductor wafer through a window of an integrated circuit manufacturing tool, wherein the manufacturing tool is a cooling tool. Therefore, it is respectfully submitted that the above cited references do not teach or suggest all of the limitations of claim 17. It is requested that the rejection of claim 17 be withdrawn.

It is also submitted that claims 18-22, which depend either directly or indirectly upon claim 17, are also patentably distinct from the above cited references for at least the same reasons as those recited above for claim 17. Thus, it is requested that the rejection of claims 18-22 be withdrawn.

Independent claim 9 pertains to a modular optical inspection system that obtains an image in a time-delay integration mode (TDI). The current Office Action states that inspection systems for wafers using time-delay integration is known by citing the instant specification. It is true that the instant specification, including Chadwick (U.S. Patent No. 4,877,326) which is incorporated by reference, disclose that the use of TDI is known in the art. However, it must be noted that the instant specification and Chadwick disclose TDI with respect to optical inspection systems that utilize a single sensor. In contrast, claim 9, pertains to an optical inspection system that utilizes a plurality of inspection subsystems that may utilize TDI. It is submitted that neither the instant specification nor Chadwick teach or suggest an inspection system where a plurality of inspection subsystems may utilize TDI. Therefore, it is requested that the rejection of claim 9 be withdrawn.

It is also submitted that claims 10-16, which depend directly upon claim 9, are also patentably distinct from the above cited references for at least the same reasons as those recited above for claim 9. Thus, it is requested that the rejection of claims 10-16 be withdrawn.

SUMMARY

It is respectfully submitted that all pending claims are allowable and that this case is now in condition for allowance. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any fees are due in connection with the filing of this Amendment, the Commissioner is authorized to deduct such fees from the undersigned's Deposit Account No. 50-0388 (Order No. KLA1P001C1). A duplicate copy of the transmittal sheet for this amendment is enclosed for this purpose.

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

Phillip P. Lee
Reg. No. P - 46,866

BEYER WEAVER & THOMAS, LLP
P.O. Box 130
Mountain View, CA 94042-0130

Telephone: (650) 961-8300
Facsimile: (650) 961-8301

APPENDIX OF PENDING CLAIMS

1. (Twice Amended) An integrated circuit manufacturing system comprising:

(a) a plurality of interrelated integrated circuit manufacturing tools capable of operating in parallel on a plurality of semiconductor wafers, **wherein the plurality of interrelated integrated circuit manufacturing tools comprise a cluster tool**;

(b) a modular optical inspection system including

a plurality of modular inspection subsystems each configured to detect defects on a portion of a semiconductor wafer,

a mechanism for moving at least one of the semiconductor wafer and the plurality of modular inspection subsystems with respect to one another, and

a master processor configured to process data delivered from at least some of the modular inspection subsystems, wherein a first one of the plurality of modular inspection subsystems includes a local processor configured to process data collected by the first modular inspection subsystem; and

(c) a handling tool for moving the semiconductor wafers among the plurality of manufacturing tools and the inspection system.

CANCEL claim 2.

3. The integrated circuit manufacturing system of claim 1, wherein the modular optical inspection system is disposed proximate a cooling stage of the plurality of interrelated integrated circuit manufacturing tools.

4. The integrated circuit manufacturing system of claim 3, wherein the modular optical inspection system is disposed above a window of one of the integrated circuit manufacturing tools.

5. The integrated circuit manufacturing system of claim 1, wherein each of the modular inspection subsystems has a field of view spanning a fraction of the width of the semiconductor wafer.

6. In an integrated circuit manufacturing system including a plurality of interrelated integrated circuit manufacturing tools capable of operating in parallel on a plurality of semiconductor wafers, a method of inspecting a semiconductor comprising:

transferring the semiconductor wafer from one of the plurality of manufacturing tools to a modular optical inspection system including a plurality of modular inspection subsystems each configured to detect defects on a portion of the semiconductor wafer**, wherein the plurality of manufacturing tools comprise a cluster tool**; and

moving at least one of the semiconductor wafer and the plurality of modular inspection subsystems with respect to one another such that each of the modular inspection subsystems inspects, in a single pass across the semiconductor wafer, an associated region of the semiconductor wafer.

CANCEL claim 7.

8. The method claim 6, wherein the modular optical inspection system is disposed above a window of a cooling tool of the plurality of interrelated integrated circuit manufacturing tools.

9. A modular optical inspection system for inspecting a surface, the inspection system comprising:

a plurality of modular inspection subsystems each configured to detect defects on a portion of the surface; and

a mechanism for moving at least one of the surface and the plurality of modular inspection subsystems with respect to one another, wherein at least one of the plurality of modular inspection subsystems includes

(i) a two-dimensional sensor configured to receive light from the surface; and

(ii) a controller configured to control the relative speeds at which

data is read from the sensor and

the modular inspection subsystem and the surface are moved with respect to one another

such that the surface is imaged in a time-delay integration mode.

10. The modular optical inspection system of claim 9, wherein all of the plurality of modular inspection subsystems include separate sensors and separate controllers.

11. The modular optical inspection system of claim 9, wherein each of the modular inspection subsystems has a field of view spanning a fraction of the width of the surface.

12. The modular optical inspection system of claim 9, wherein the controller causes one row of pixel data to be read from the two-dimensional sensor each time the at least one inspection subsystem moves by one pixel length with respect to the surface.

13. The modular optical inspection system of claim 9, wherein the two-dimensional sensor includes at least one of a CCD array.

14. The modular optical inspection system of claim 9, wherein at least one of the modular inspection subsystems comprises an illuminator capable of emitting light at a wavelength of no greater than about 500 nm.

15. The modular optical inspection system of claim 9, wherein at least one of the modular inspection subsystems comprises a coherent light source selected from the group consisting of diode lasers, Helium Neon lasers, Argon lasers, and frequency doubled YAG lasers.

16. The modular optical inspection system of claim 9, wherein at least one of said modular inspection subsystems contains an ellipsometer configured to measure the thickness of a layer on the surface.

17. A modular optical inspection system for inspecting a surface, the inspection system comprising:

a plurality of modular inspection subsystems each configured to detect defects on a portion of the surface;

a mechanism for moving at least one of the surface and the plurality of modular inspection subsystems with respect to one another; and

a master processor configured to process data delivered from at least some of the modular inspection subsystems,

wherein a first one of the plurality of modular inspection subsystems includes a local processor configured to process data collected by the first modular inspection subsystem**, also wherein the modular optical inspection system is disposed above a window of an integrated circuit manufacturing tool, the integrated circuit manufacturing tool being a cluster tool**.

18. The modular optical inspection system of claim 17, wherein all of the plurality of modular inspection subsystems include separate local processors.

19. The modular optical inspection system of claim 18, wherein the master processor is connected to each of the separate local processors.

20. The modular optical inspection system of claim 17, wherein each of the modular inspection subsystems has a field of view spanning a fraction of the width of the surface.

21. The modular optical inspection system of claim 17, wherein the local processor comprises a digital signal processor.

22. The modular optical inspection system of claim 17, wherein local processor implements an algorithm that distinguishes valid pattern scattering from defect scattering on the surface.